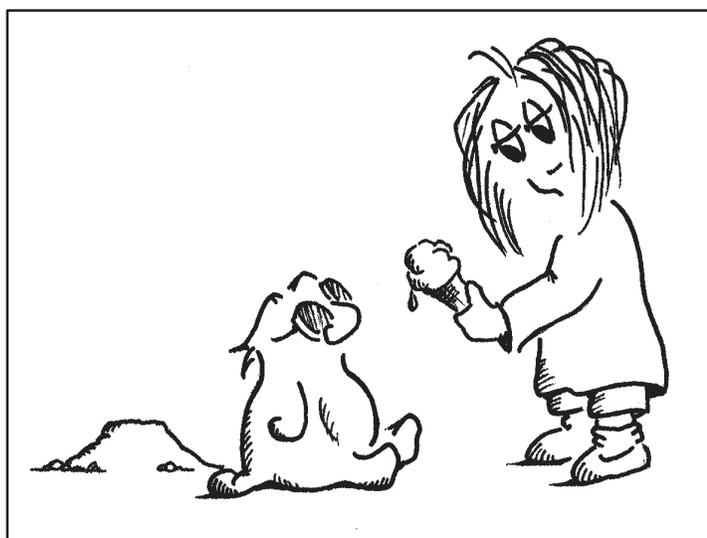




Science on the Web

Activity 6 The Sun

Jane's class was planning a picnic at a park quite a ways from the school. They had earned this outing by turning in what their teacher, Mr. Schultz, said were excellent projects (and all of them in on time!). That must have been a first, because Mr. Schultz was not one to take a day off from class! There were teams working on different parts of the picnic: the food, the transportation, the activities, the music (that was Jane's team); and each team was supposed to do more than just decide things. Mr. Schultz expected his students to research everything and give a report to the class. Think of the poor team that had to research the food, thought Jane! Of course, this couldn't be just a day off. But, hey, at least the day would be fun when it came.

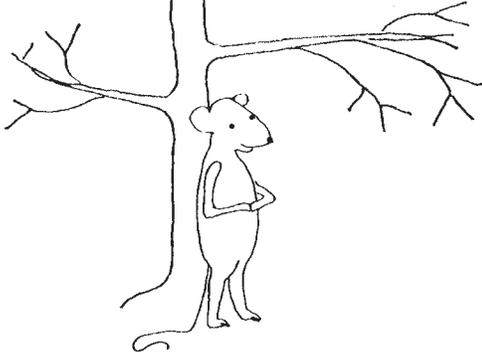


Jane's team knew they had an important project. Her classmates knew music, and they practically lived and breathed the rhythms of the latest hits. They debated whether they could use the radio or should take a boom box and tapes instead. The radio would be most convenient, but they didn't know how the radio reception would be so far out of town. Elvis Jones was on Jane's team, too. He seemed to know a lot about radio. He was a "ham" (in more ways than one, thought Jane). He operated his radio almost every night, talking to people from all over the world. He said he had talked to someone who lived near the park recently; he'd call him and ask about the radio reception.

Boy, this was going to be an easy project. Elvis would do the research and they would be done with it. The next day, Elvis had found out about the reception: it depended on the Sun and what had happened 1.5×10^8 km away! Sunspots can affect radio communications. To decide if the radio would work, they would have to find out what the Sun was doing. Apparently, Jane was going to be doing some research, too, but she knew the Web would be able to give her some information in a hurry.

Mr. Shultz suggested using a browser to look at gopher sites, whatever they were. Jane thought this was going to be hard, but Mr. Shultz used Netscape to get into lists of data types and files. This much data couldn't be displayed in a Web page, and you couldn't possibly wait while loading every image. The file lists allow you to select the image or data you want.

Hierarchical vs. Hyperlinked



A hierarchical file structure is like a branching tree. You find the file you want by selecting a directory and subdirectories until you get to what you need. Gopher sites are hierarchical.

Most of what you see on the Web looks hierarchical, but the pages are really hyperlinked. Hyperlinks let you jump from one place to another: take a jump from limb to limb, and not have to go up and down the tree.



Find a gopher site

The **gopher** software was designed to show you a menu of directories to make looking for files easier. The **gopher** servers are used less and less as the Web has grown. But Web browsers do fine looking at **gopher** sites, and you will want to have access to the files at a **gopher** site.

In order to find an entry in a **gopher** site, you need to use a special search engine. You can use the Web search engines to get to the **gopher** search program **veronica**. The resulting list can then be accessed with your Web browser to open the site.

In your search engine, type **veronica**. Get one that searches Gopherspace (not someone named Veronica’s home page). The first one on my list was at the University of Nevada, Reno.

<http://veronica.scs.unr.edu/veronica.html>

Bring up one of their servers and request “solar images.”

Look at a sunspot

Take a look at a sunspot, not by looking at the Sun, but at a photographic image. If you haven’t found a site with solar images from your search above, you can go to the Space Environment Center’s **gopher** pages. Start at their home page.

<http://www.sec.noaa.gov>

[Data Directories](#)

Note the URL listed for this site. You could have gotten to it by typing **gopher://sec.noaa.gov**

On the Gopher Menu pages, you see a list of directories and files. You navigate them much as you would a file system on your computer. *Click* on the directory to which you wish to move or on the file you want to view.

[Solar Images in GIF format](#)

Look at images, both large scale and full disk, in March 98 or current files

White Light and H-alpha images are going to be the most useful to you.

White Light images are what you would see if you could look directly at the Sun. (Remember, staring directly at the sun will cause permanent damage to your retina.) All colors of light make up “white light,” that you normally see. Galileo



observed sunspots on the Sun in white light in 1630, thus showing that the Sun was not “perfect.” For this and other heresies he was put under house arrest for the rest of his life.

What you see in an H-alpha image, taken with a filter that only allows the light emitted by the alpha state of Hydrogen. That wavelength reveals a lot about the surface temperatures of the Sun. Sunspots are “cool” compared to the rest of the surface, but if you could pluck one off the Sun and hold it in the sky, it would burn almost as brightly as the Sun.

Return to the SEC home page (using **Back** several times or the address above) and read about sunspots.

[Explanation and Information](#)

[Primer on the Space Environment](#)



Questions

- 6–1. What do sunspots look like?
- 6–2. In how many ways does the solar disk that we see in the sky vary?



Finding sunspot data

Images aren’t enough to tell you about sunspots. You need to be a trained observer to find all the spots. Go to the National Geophysical Data Center home page

<http://www.ngdc.noaa.gov>

[Solar-Terrestrial Physics](#)

[On-Line Data \(SPIDR\)](#)

[Solar Information](#) (in the text below the heading)

[Solar and Interplanetary Phenomena](#)

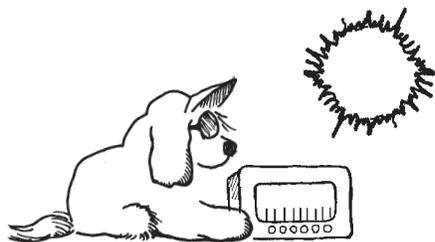
[Sunspot Numbers](#)

Enlarge the plots so you can read the plot axes.



Questions

- 6–3. How many years of data are available? Which recent year had a high count? a low count? How many years passed between the last two peaks?
- 6–4. What is it that Wolf discovered (shown in the plots)?



Elvis was pretty thrilled with this sunspot data. This would help explain a lot about his ham radio operation, and he couldn't wait to understand it all and tell all his friends about it on the air waves that evening. But the sunspot cycle only told him what "season" it was and wouldn't really tell him anything about today's "solar weather." Jane thought finding the solar weather was a pretty esoteric request, but she agreed to keep looking for information and kept her doubts to herself. To her amazement, she found exactly what Elvis wanted. When she nonchalantly handed him a printout of the "High Frequency Radio Propagation Report," he couldn't hide his astonishment.



Get the High Frequency Radio Report

Go to the home page of the IPS Radio and Space Services, Australia, site (note the .au on the end of the address):

<http://www.ips.gov.au>

[Current IPS Solar Terrestrial Report](#)

Scroll down on the page to Space Weather Status Panel. Note that green means OK, red means warning or alert. How do the conditions look for HF propagation conditions and real-time ionospheric conditions in North America?

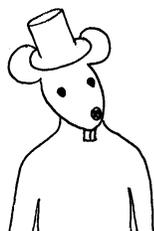
[Support for HF Radio in North America](#)

[Real-Time HAP Charts](#)

[San Francisco](#)

Print the map on this page. Try to find out what it means, using the descriptions at this Website.

Heads Up!



*Internet addresses indicate sites that are outside the U.S. Australia addresses end in **.au**, Japan addresses, **.jp**. It's fun to inspect addresses and realize that you are online with France or Russia. Check out Country Extension Abbreviations at <http://www.bendigo.net.au/general/country.html>*

Be aware that you can get to anywhere in the world as easily as any other. But transfer files from the closer site if you have a choice.



Questions

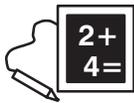
- 6–5. Based on the information about conditions, what should Elvis recommend doing about the music?
- 6–6. If you know anyone who is a ham radio expert, ask them to help you calculate a frequency prediction using the [On-Line HF Prediction](#) (at http://www.ips.gov.au/asfc/usa_hf). Is this of use to them?





It was getting on toward 5:00 PM, and Jane wanted to be home. But she kept wanting to do “just one more thing.” Richard was always so impressed by astronomical happenings. She thought it would be really neat to bring home for him some Sun pictures—printed right there on her local printer. She called home and said she’d be a little late. She promised to be there by dinner time, and asked Richard to kiss the puppy for her. (“Right!” Richard had said, sarcastically.)

In May of 1994, an annular eclipse of the Sun was visible in North America. An annular eclipse is one where the moon doesn’t quite cover the Sun, leaving a thin, bright “annulus” or ring. There are views of this event from several different locations in the country. Then there was a total eclipse of the Sun in February 1998 was viewed in near-real time in several places on the Web. She’d take a look at those pictures and note where she could watch during the next eclipse.



Eclipse Pictures

Pictures of the annular eclipse

Go to the **ftp** site at the National Geophysical Data Center.

ftp://ftp.ngdc.noaa.gov

STP
ECLIPSE

Open `read_me.txt` to find out what the images in this directory are about.

Click on [boulder.mpg](#) if you have a movie viewer installed.

Click on [boulder.avi](#) if you don’t have the movie viewer.

Look at the other files in this directory so you can answer the questions below.

Now download the **gif** images **ec_bou1.gif** and **ec_holo.gif**. * Import the gif files into a word processor or other program, and print them to your printer.

This exercise could have been a bit easier; the pictures are now on a Web site. It’s important to know how to transfer files from an **ftp** site. Just for fun, see what the Web pages look like at <http://www.ngdc.noaa.gov/stp>

*GIF stands for Graphics Interchange Format. The Web uses GIF images a lot, and browsers are good at looking at them.

Pictures of the total eclipse

The total eclipse of the sun that occurred in February 1998 was observed in real time on the Web, despite its having occurred in the Carribean. One site that carried the event was Rice University's.

<http://space.rice.edu>

[Solar Eclipse 98](#)

Select several of the images to look at. You can see that there are descriptive names for the images. To what do they refer?



Questions

- 6–7. How are the two views of the 1994 annular eclipse (from Boulder and from Holoman) different? Where were the photographs made?
- 6–8. Find a map of the path of the eclipse. What part of the United States saw the annular eclipse?
- 6–9. How was the eclipse of 1994 different from 1998?

